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MODE OF HUMAN IMAGE REPRESENTATION AND ERROR CHECKING STRATEGIES IN COMPLEX VISUAL DISPLAYS

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13. ABSTRACT (Maximum 200 words)

Experimental designs are currently being developed which will utilize the laboratory resources obtained under this grant for the purpose of examining error-checking strategies of human observers when monitoring complex visual displays. Some preliminary software has been developed and it is hoped that this development will be able to continue with the acquisition of research support. During the period of this grant, discussions were held with staff at the National Transportation Safety Board and with staff at the Aviation Safety Reporting System Office at Battelle which provided us with data base searches of human error incidents involved in aircraft accidents. This data has been extremely useful in our preliminary development of experimental protocols which will allow us to develop Department of Defense relevant research studies.

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MODE OF HUMAN IMAGE REPRESENTATION AND ERROR CHECKING
STRATEGIES IN COMPLEX VISUAL DISPLAYS

FINAL TECHNICAL REPORT
GRANT NO. FA 9620-93-1-0608
December 9, 1994

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Dr. Albert B. Miller
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Delaware State University
Dover, DE 19901

28 DEC 1994

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- III. General Configuration of the Laboratory Resulting from the Grant
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I. Project Goals

The major goal of this grant was to acquire equipment to set up a laboratory capable of conducting research of interest to the Department of Defense in a manner which would make the human cognition laboratory at Delaware State University capable of competing for research funding in DOD relevant areas.

II. Planning and Development Effort to Create DOD Relevant Research Productive Laboratory

In achieving our primary goal, it was necessary to examine and make provisions for the following functions:

- a. networking of all laboratory resources
- b. data acquisition involving electrophysiological data and numerical and video image data
- c. a variety of data analysis and graphic image protocols
- d. video image creation, capture and editing

These major resources were necessary in order to design effective DOD relevant research protocols. All of the equipment acquired is designed to achieve these objectives.

III. General Configuration of the Laboratory Resulting from the Grant

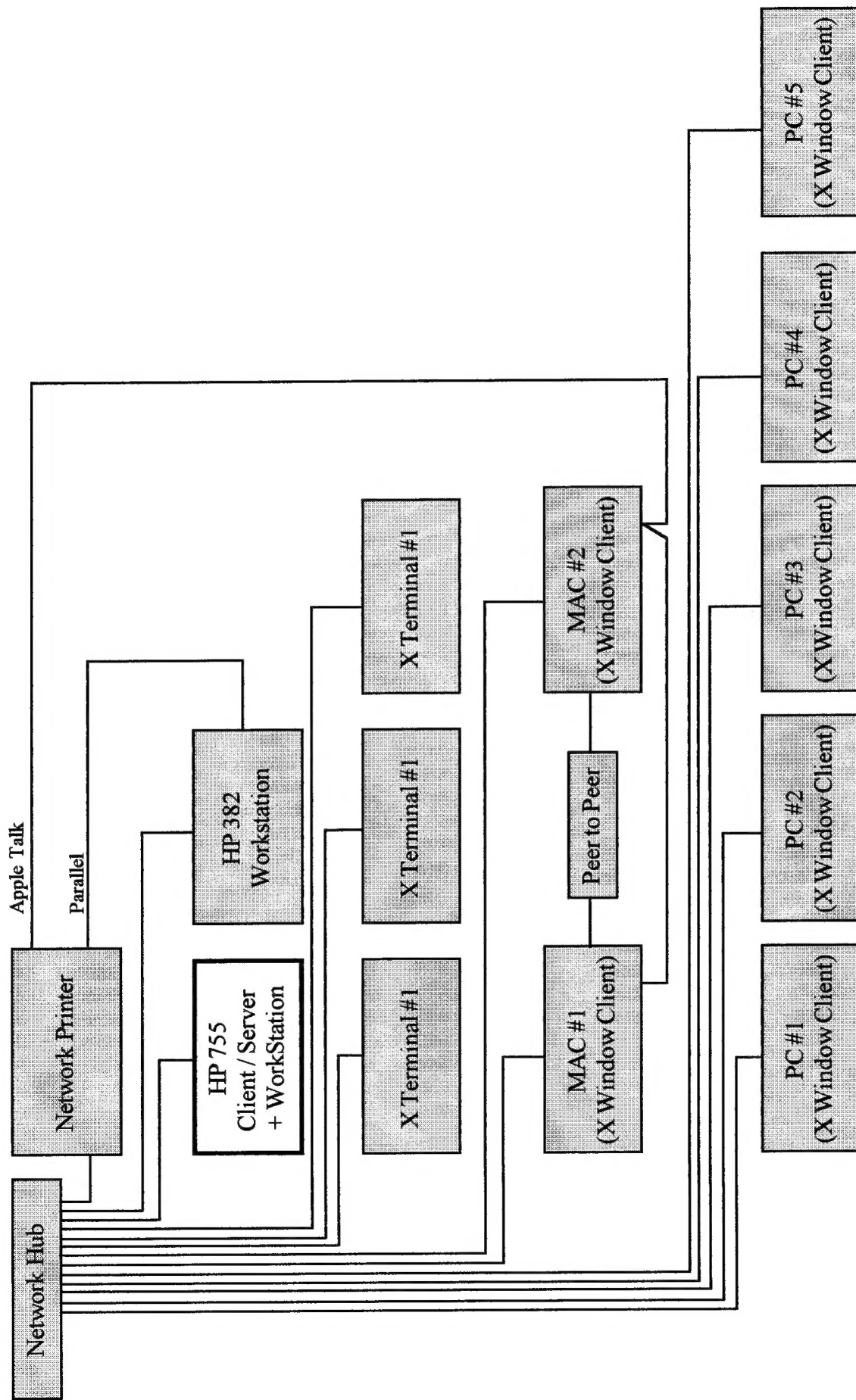
The laboratory configuration is built around an HP765 UNIX workstation which functions as the laboratory Server to remote X-Terminals and PCs which will be configured as X-WINDOWS Clients. These PCs will serve as the human subject display interface for the experimental protocols. The Server has image capture software capable of digitizing video images in formats compatible with PCs which have been configured to absorb the major image editing tasks. (All of this equipment has been purchased under the current grant.) A flow chart showing the Ethernet network configuration is presented in Figure 1.

IV. Summary of Planned Research Which Will Utilize the New Laboratory Resources

Experimental designs are currently being developed which will utilize the laboratory resources obtained under this grant for the purpose of examining error-checking strategies of human observers when monitoring complex visual displays. Some preliminary software has been developed and it is hoped that this development will be able to continue with the acquisition of research support. During the period of this grant, discussions were held with staff at the National Transportation Safety Board and with staff at the Aviation Safety Reporting System Office at Battelle (letter attached) which provided us with data base searches of human error incidents involved in aircraft accidents. This data has been extremely useful in our preliminary development of experimental protocols which will allow us to develop Department of Defense relevant research studies.

V. Itemized List of Purchases Made Under Grant No. FA 9620-93-1-0608

All equipment acquired under this grant retains all of the general functionality of the equipment originally proposed although in most cases there were changes made to minimize item cost where possible, to obtain the most current models of all equipment and to maximize in all cases the acquisition of equipment that reflected the current state of the art of the particular type of equipment obtained. Listed below are the actual items purchased.



Laboratory Network Configuration

Figure 1



Battelle

... Putting Technology To Work

ASRS Office
625 Ellis Street
Suite 305
Mountain View, California 94043
Telephone (415) 969-3969

August 29, 1994

Dr. Albert Miller
Delaware State University
Department of Psychology
Dover, DL 19901

Dear Dr. Miller:

SEARCH REQUEST NO. 3617: "HUMAN ERROR INCIDENTS"

In response to your request of NASA's Aviation Safety Reporting System, enclosed is a diskette containing 300 reports referencing alleged human error incidents. These reports have been separated into advanced cockpit flight crew errors (100), and air carrier, general aviation, corporate, and air traffic control human errors (200). An additional 90 reports referencing advanced cockpit flight crew errors are available should you require them. Attached is an explanation of the coded information contained in your diskette.

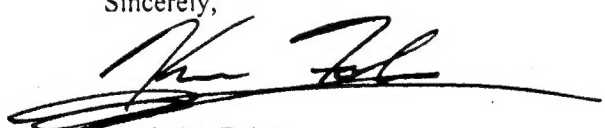
At the time of this search, the ASRS database contained 46,798 full-form records received since January 1, 1986. There were also 117,772 abbreviated-form records in the database, but since incidents involving the above-mentioned topic are not identifiable in these records, they were excluded from the search.

Please bear in mind that the ASRS reports are soft data. The reports are submitted voluntarily and are subject to self-reporting biases. Such incidents, in many cases, have not been corroborated by the FAA or NTSB.

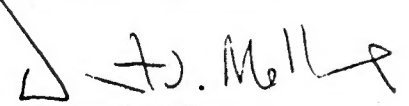
We hope you find this information useful for your purposes. Please note with care the attached caveat regarding statistical use of ASRS information and the point Mr. Reynard makes in his covering memorandum to recipients.

We would appreciate any comments you have regarding the value of this service. If you have any questions or comments, please do not hesitate to contact us at (415) 969-3969.

Sincerely,



Kevin M. Foley
ASRS Database Specialist



Vincent J. Mellone
ASRS Deputy Program Manager

KMF

Enclosures

Equipment Acquired Under
Grant No. FA9620-93-1-0608

All equipment acquired under this grant retains all of the general functionality of the equipment originally proposed although in most cases there were changes made to minimize item cost where possible, to obtain the most current models of all equipment and to maximize in all cases the acquisition of equipment that reflected the current state of the art of the particular type of equipment obtained. Listed below are the actual items purchased.

Digital Equipment Corporation

<u>Item Description</u>	<u>Cost</u>
DECpc XL 566	\$ 4,179.05
16 MB 70NS, Simm Memory	\$ 665.00
DEC pc 5.25" 1.2 MB	\$ 71.25
PC half card modem	\$ 189.05
Viper PCI Video Adapter	\$ 379.05
19" Trinitron Hi-Res, LE (2)	\$ 3,798.10
16 MB, 70NS, Simm Memory	\$ 760.00
DEC pc 5.25" 1.2 MB	\$ 71.25
PC half card modem	\$ 189.05
Viper PCI Video Adapter	\$ 664.05
Laboratory Microprocesser	Digital Equip \$ 7,097.45
FR-783AA-WN 16MB16MB	Digital Equip \$ 4,369.05
FR-783AA-WJ, DECPC XL590 System (4)	Digital Equip. \$15,896.00
FR-PCXAv-EA decpc monitor(4)	" " \$ 3,996.00
FR-PC7XR-BA DECPC Disk Drive	" " 300.00
FR-PCXAG-AM Viper PCI Video Adapter	" " \$ 1,596.00

FR-DE205-AB, Etherworks 3 Turbo Plus "" \$ 692.00

Hewlett-Packard Company

<u>Item Description</u>	<u>Cost</u>
MDL 755 CRX24Z STD config.	\$38,786.30
2GB Single-Ended SCSI II Option 011	\$ 435.50
2GB Fast-Wide Option ATA	\$ 3,249.50
660MB SCSI CD ROM Option AM8	\$ 566.15
3.5" 1.4MB SCSI Option AMB	\$ 351.75
64MB memory Option ANQ	\$ 3,430.00
First Year of System Support. Option OS2	\$ 1,293.10
HP-UX WKST localization kit	\$ 70.35
HP-UX release 9.0 Option APH	\$ 0.00
US English localized version Option ABA	\$ 0.00
HP-UX Run-Time operation systems	\$ 0.00
HP-UX software Option AAB	\$ 260.00
HP-UX 9.0 2-User Option APH	\$ 62.50
200MB of hard swap space Option ATC	\$ 0.00
200 Megabytes of hard swap space Option ATF	\$ 0.00
License to use HP-UX 9.0	\$ 188.50
9.0 version of software Option APH	\$ 0.00
Software preloaded Option OD1	\$ 0.00
CD-ROM Certificate Option AAU	\$ 0.00
US power cord Option ABA	\$ 0.00
HP series 6400 Model 2000DC	\$ 2,212.50
First year of system support Option OS2	\$ 74.25

DDS cartridge	\$ 85.00
Rewriteable Optical Disk	\$ 140.00
SCSI Terminator low density	\$ 40.00
SCSI 2 High density	\$ 88.00
Small computer system interface cable	\$ 55.00
Series 700 HP-UX 9.0 Documentation	\$ 0.00
Documentation on CD-ROM Option OBC	\$ 417.50
B2355B manuals Option OBJ	\$ 79.00
HP-UX System Administration Option OBE	\$ 342.50
Hardcopy manuals Option OBF	\$ 170.00
HP-UX Advanced Usage manuals Option OBG	\$ 92.00
HP-UX User Environment Programming manuals Option OBL	\$ 365.00
First year of system support Option OS2	\$ 52.50
Standard instrument control library	\$ 250.00
Instrument control I/O library Option AAF	\$ 0.00
High speed HP-IB interface	\$ 497.50
T&M productivity assistance	\$ 7,650.00
5 day course at HP	\$ 1,550.00
HP BASIC/UX S700 license	\$ 400.00
HP BASIC/UX S700 upgrade Option OC	\$ 100.00
HP 19" Color monitor	\$ 4,556.00
UNIX starter kit	\$ 950.00
HP BASIC/UX S700 media	\$ 0.00
HP BASIC/UX S700 media on CD-ROM Option AAF	\$ 450.00
HP/BASIC/UX S700 media on DDS Option AAH	\$ 450.00
HP BASIC/UX S700 license-to-use.	\$ 400.00

19" 1280x1024 72Hz color monitor Option 191	\$ 3,075.30
HP-UX keyboard with HP-HIL interface	\$ 70.35
HP-UX keyboard Option ABA	\$ 0.00
MNL: INSTAL. PERIPHERAL	\$ 47.00
5 day course at HP\ system	\$ 1,845.00
T&M response center phone support	\$ 25.00
T&M response center phone support	\$ 17.00
Mpower	\$ 123.75
HP-UX 9.0 binaries Option APH	\$ 0.00
Mpower client factory integration Option OD1	\$ 0.00
Mpower client CD-ROM certificate Option AAU	\$ 0.00
Mpower	\$ 373.75
HP-UX 9.0 bianaries for Mpower Option APH	\$ 0.00
Instant Ignition Option OD1	\$ 0.00
CD-ROM certificate Option AAU	\$ 0.00
License-to-use HP-PEX	\$ 437.50
Software for HP-UX release 9.0 Option APH	\$ 0.00
CD-ROM certificate Option OD1	\$ 0.00
CD-ROM certificate Option AAU	\$ 0.00
Group response line for HP 9000	\$ 0.00
HP Responseline support for 700(2) Option ONA	\$ 37.00
Application support/software dev. Option ON1	\$ 74.00
Application caller Option OMB	\$ 0.00
HP Software Update materials for Wkstns	\$ 0.00
HP Support materials Option ONA	\$ 21.00
Mpower	\$ 123.75

HP-UX 9.0 binaries Option APH	\$	0.00
Instant Ignition Option OD1	\$	0.00
Mpower client CD-ROM certificate Option AAU	\$	0.00
Mpower	\$	373.75
HP-UX 9.0 bianaries for Mpower server Option APH	\$	0.00
Mpower server factory intergration Option OD1	\$	0.00
Mpower server CD-ROM certificate Option AAU	\$	0.00
License-to-use HP-PEX	\$	437.50
Software for HP-UX release 9.0 Option APH	\$	0.00
CD-ROM certificate Option OD1	\$	0.00
CD-ROM certificate Option AAU	\$	0.00
Group response line	\$	0.00
HP Responseline Option ONA	\$	37.00
Application support/software dev. Option ON1	\$	74.00
Application caller Option OMB	\$	0.00
HP Software Update materials for Wkstns	\$	0.00
HP Support materials Option ONA	\$	21.00

Tektronix, Inc.

<u>Item Description</u>		<u>Cost</u>
XP358 COLOR XTERMINAL	TEK	\$ 7,300.00
B9 SW LICENSE	""	\$ 60.00
25 ADD 8MB SIMM, 2 4MB SIMMS	""	\$ 1,200.00
3L MOTIF LOCAL, WINDOW MANAGER	""	\$ 70.00
AV AVXPRESS	""	\$ 490.00

SO INSTALLATION	""	\$ 318.00
E3 XPRESS EXCHANGE	""	\$ 538.00
XPFXN IBM101 KEYBOARD	""	\$ 69.60
XPCD06 HP CD ROM	""	\$ 635.10
XP300n Color Xterminal	""	\$ 9,362.94
XPFXN IBM 101 Keyboard	""	\$ 69.60
XPCD HP CD ROM	""	\$ 304.50
Light Pen System	FTG Data Systems	\$ 1,387.80
COVID Video Media System	Covid, Inc.	\$ 4,549.00
Global Computer Supply		
KT Labs Pocket Hard Drive	""	\$ 699.95
Ergo Flex Workstation	""	\$ 1,480.00
Coactive Connector Starter Kit		\$ 399.90
View Sonic Color Monitor	""	\$ 899.95
Lab Workstations(4)	""	\$ 2,399.00
Lab Rennovations,Including:	Intelligent Appl. Corp.	\$22,400.00
Power Dist\Network Connection\		
Inst. Interfacing\Electronic Supplies\		
Cables, connectors, etc.		
Litepro 550/Proj. System	Future Enterprises	\$ 6,961.00
HT Basic HP WKSTA	Transera, Inc.	\$ 2,295.00
HT Basic Hp 700 Media & Mauals	""	\$ 250.00
HT Basic HP 700 Wksta Ver. CSUB Kit	""	\$ 495.00
HT Basic HP 700 Wksta Ver. Math Lib	""	\$ 495.00
HT Basic HP 700 Wksta DDS	""	\$ 50.00
HP540/560 Print System	Hewlett-Packard	\$ 2,866.00
Image Editing System	SONY	\$ 4,049.00
Network Analysis Microprocessor	IBM	\$ 6,966.00

HON 514C 089192 HON 510 Series Files 08693	GA Blanco & Sons	\$ 654.00
HON F-26 UPC00082 Lock 510 Series	""	\$ 74.80
Capacitive Touch Screen Solution For Tektronix X Terminal	Trident Systems, Inc.	\$ 1,700.00
VISCA Package including CVD-100 V Box Computer Interface,EZV2 Edit Software, Control Cable 9 pin	B & H Photos	\$ 1,995.00
Digital Camera	Cole Palmer Co.	\$ 768.00
VGA to TV Converter	""	\$ 199.95
Parallel and Serial Autoswitches	""	\$ 160.00
Parallel and Serial Autoswitches	""	\$ 182.00
Automatic A-B Switch	""	\$ 55.00
Automatic A-B Switch	""	\$ 55.00
Automatic Cablemaker	""	\$ 169.95
Interface Converter (2)	""	\$ 209.00
X-STAT	""	\$ 595.00
Projector	Kuntz Inc.	\$ 479.63
Projection Table	""	\$ 51.74
Apple Quick Take 100-M1644KK/B	Apple Comp. Inc.	\$ 653.00
Apple Design Powered Speakers II M326111/A	""	\$ 288.00
Adams Essentials - TCH 0502	""	\$ 249.00
Apple ADJ Keyboard M12411/A	""	\$ 200.00
S-PC PRO 3.1 TCH 0188	""	\$ 179.00
S-WIN-TCH 0190	""	\$ 229.00
270 MB Syquest Drive APP 0022	""	\$ 529.95
270 MB CART.APP 0014	""	\$ 218.85
105MB Cart.APP 0016	""	\$ 203.85

Printer Select 360 B1333LL/A	""	\$ 1,344.00
Cartridge M1960G/A	""	\$ 154.00
Data Switch	Micro Warehouse	\$ 64.00
8 Port Video Splitter	""	\$ 499.00
8-1 Auto Switch-Parallel	""	\$ 119.00
50ft Extension Cable	""	\$ 18.00
NEC # JC1731 VMAA-3 17" Monitor	Info sys	\$ 1,986.24
Smart UPS #AP1250 Power Back Up	""	\$ 1,127.32
#KVH100 Cobra Projector System	Paper Direct	\$ 1,079.60
#KVH102 Marker/Templates	""	\$ 70.80
Meridian Personal Scribe 1000 Alchemy Bundle P/No512262013	I-Net	\$ 6,124.00
Software and Computer Supplies	DSR Inc.	\$ 1,450.00
MCA 5100 Workstations	Berger Bros.	\$ 876.00
MCA 5200 Workstations	""	\$ 338.00
Media Magic Multi Media Solution	Media Magic, Inc.	\$ 4,415.00
FR-PCXAG-AM-Viper PCI Vid. Adapt	""	\$ 379.05
FR_PCXAV_HA 21" monitor	""	\$ 1,899.00
FO-4800 G3 Com. System	Sharp Electronics	\$ 2,195.00
Synergy and Keyboard Storage Drawer	Corporate Express	\$ 187.33
SLV 770 Video Deck	Sony	\$ 1,493.91
MDP 600 LASer Disk	""	\$ 699.00
LAB Furniture Lab Rennovations Supplies	White & Leonard, Inc.	\$ 4,164.00
HP 4SI Printer	PC Age	\$ 2,600.00
HP MX Printer	""	\$ 3,850.00
8 MByte Simm Memory Boards	""	\$ 1,625.00

Apple Ext Keyboard	Apple Comp. Inc.	\$ 320.00
Power MAC 8100	""	\$ 4,930.00
Apple Multi Scan Display	""	\$ 1,872.00
Quadra	""	\$ 4,518.00
Audio Vision 14"	""	\$ 629.00
Mac 16 Color Display	""	\$ 904.00
Apple Design Speakers	""	\$ 138.00
Geoport Adapter	""	\$ 105.00
Apple Ethernet	""	\$ 76.00
8 Meg Simms	""	\$ 1,632.00
HP 1200/520 Printer	Hewlett Packard	\$ 2,609.00
HP II CX Scanner	""	\$ 896.00
Ink Cartridges (4)	""	\$ 193.00
32 Meg Simm Memory	""	\$ 975.00
Instrumentation Installation Setup/checkout	Intelligent Appl. Corp	\$12,210.00
Shipping Charges		\$ 1,035.00
TOTAL		<u>\$284,245.61</u>